

### Listing of Claims:

1. (Currently Amended) A method for manufacturing a diamond film comprising:  
forming a plasma of finite volume near a substrate by subjecting a gas containing at least hydrogen and carbon in a vacuum chamber to periodic pulsed discharges using a pulsed microwave plasma by applying a repeated succession of a low-power state and a high-power state, in which the ratio of the duration of the high-power state to the duration of the low-power state is between 1/9 and 1, and having a peak absorbed power  $P_c$ , so as to obtain at least carbon-containing radicals in the plasma, and depositing the said carbon-containing radicals on the substrate in order to form a diamond film thereon;  
wherein the power being injected into the volume of the plasma with a peak power density of at least  $100 \text{ W/cm}^3$  while maintaining the substrate to a substrate temperature of between  $700^\circ\text{C}$  and  $1000^\circ\text{C}$ .
2. (Currently amended) The method according to Claim 1, in which a plasma having at least one of the following features is generated near the substrate:
  - ~~the pulsed discharge has a certain peak absorbed power  $P_c$  and the peak power density to the volume of the plasma is between  $100 \text{ W/cm}^3$  and  $250 \text{ W/cm}^3$ ,~~
  - the maximum temperature of the plasma is between  $3500 \text{ K}$  and  $5000 \text{ K}$ ,
  - the temperature of the plasma in a boundary region of the plasma located less than  $1 \text{ cm}$  from the surface of the substrate is between  $1500 \text{ K}$  and  $3000 \text{ K}$  and
  - the plasma contains hydrogen atoms having a maximum concentration in the plasma of between  $1.7 \times 10^{16}$  and  $5 \times 10^{17} \text{ cm}^{-3}$ .
3. (Previously Presented) The method according to Claim 1 or Claim 2, in which said gas contains carbon and hydrogen in a carbon/hydrogen molar ratio of between  $1\%$  and  $12\%$ .
4. (Previously Presented) The method according to Claim 1, in which said gas contains at least one hydro-carbon, and a plasma having a concentration of the carbon-containing radicals of between  $2 \times 10^{14} \text{ cm}^{-3}$  and  $1 \times 10^{15} \text{ cm}^{-3}$  is generated.
5. (Cancelled)

6. (Previously Presented) The method according to Claim 1, in which at least one of the following parameters is estimated:

- a substrate temperature,
- a temperature of the plasma,
- a temperature of the plasma in said boundary region, located less than 1 cm from the surface of the substrate,
- a concentration of atomic hydrogen in the plasma,
- a concentration of carbon-containing radicals in the plasma,
- a concentration of carbon-containing radicals in said boundary region close to the plasma,
- a pressure of the plasma and
- a power density of the plasma,

and the power emitted as a function of time is adapted according to at least one of these parameters.

7. (Currently amended) The method according to Claim 1, in which the plasma is contained in a cavity with at least one of the following properties:

- the periodic pulsed discharges ~~pulsed discharge has~~ have a peak power of at least 5 kW at 2.45 GHz,
- the pressure of the plasma is between 100 mbar and 350 mbar and
- the gas containing hydrogen and carbon is emitted with a ratio of the flow rate to the volume of plasma of between 0.75 and 7.5 sccm/cm<sup>3</sup>.

8. (Currently amended) The method according to Claim 1, in which the plasma is contained in a cavity with at least one of the following properties:

- the periodic pulsed discharges ~~have pulsed discharge has~~ have a peak power of at least 10 kW at 915 MHz,
- the pressure of the plasma is between 100 mbar and 350 mbar and
- the gas containing hydrogen and carbon is emitted with a ratio of the flow rate to the volume of the plasma of between 0.75 and 7.5 sccm/cm<sup>3</sup>.